SAFETY CULTURE VERSUS SAFETY MANAGEMENT

BACKGROUND

The Commission provided direction to the staff which stated, in part, to enhance the treatment of cross-cutting areas of the Reactor Oversight Process (ROP) to more fully address safety culture. The Commission provided this direction in Staff Requirements Memorandum (SRM) SRM/SECY-04-0111 and more recently in SRM/SECY-05-0187. The major direction in SRM SECY-04-0111 was to:

- "…enhance the Reactor Oversight Process ... treatment of cross-cutting issues to more fully address Safety Culture."
- "…include as part of its enhanced inspection activities for plants in the Degraded Cornerstone Column (referred to as Column Three) of the [ROP] Action Matrix, a determination of the need for a specific evaluation of the licensee's Safety Culture…The staff's methodology for using the treatment of cross-cutting issues to more fully address Safety Culture, should require a specific determination for plants in the Degraded Cornerstone Column."

In addition, the Commission directed the staff to:

- "…consider if the cross-cutting issues in the enhanced [Reactor Oversight Process] treatment may be more appropriately labeled Safety Management rather than Safety Culture."

This paper addresses the issue of using the term "Safety Management" versus "Safety Culture."

DISCUSSION

The goal of the U.S. Nuclear Regulatory Commission's (NRC) safety culture initiative is to enhance the NRC's Reactor Oversight Process (ROP) to more fully address safety culture. Safety culture is both an *outcome* of safety management and a *determinant* of aspects of safety management.

Safety Culture Definition

"Safety culture" as a term was first coined by the International Atomic Energy Agency (IAEA) International Nuclear Safety Advisory Group (INSAG) in their INSAG-3 Report (1989) following the Chernobyl accident, and has been in wide use since then. INSAG-3 resulted in broad international interest in the expansion and formalization of the concept of "safety culture" in a manner that would be useful for nuclear power plant operators and regulators. In response to this interest, INSAG-4 presented a formal consensus definition developed by the INSAG members.

The staff has adopted the INSAG-4 definition of safety culture as presented in the INSAG-4 Report (1991) which has been historically referenced by the Commission. The INSAG-4 definition is *"that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention*

warranted by their significance." INSAG-4 also states "*safety culture is both attitudinal as well as structural and relates to both organizations and individuals*."

Safety Management Definition

Safety management is *how* an organization promotes safety culture and achieves safety performance. "Safety Management" as a term was first used formally in 1999 in INSAG-13, which was geared toward nuclear power plant managing organizations as noted in the foreword while INSAG-4 on safety culture was intended for a wider audience including regulators. INSAG-13 states that safety management is "*the structural aspect of safety culture comprises the organization's arrangements for safety, which is commonly described as the safety management system of the organization*… '*Management' is used to mean the administration of the organization*." …"The *safety management system* comprises those *arrangements made by the organization for the management of safety in order to promote a strong safety culture and achieve good safety performance*."

Figure 1 from the INSAG-4 document illustrates the concepts and elements of safety culture as it is commonly defined. Safety management encompasses a subset of the safety culture elements in the figure (e.g., programmatic elements shown to the left of the "management commitment" element, such as the definition of responsibilities and rewards and sanctions) and also reaches beyond safety culture to other organizational aspects of safety performance (e.g., quality assurance programs) which may be outside the scope of the safety culture initiative.

Use of Terms

The NRC has held eight public meetings (August 2005 through February 2006) as part of the agency's safety culture initiative. Meeting participants included representatives from utility companies, nuclear power plants, industry groups, and public interest groups. In the course of the meetings, the participants agreed that there is a common understanding of the term *safety culture*. This term is used by industry organizations in the U.S., such as the Institute of Nuclear Power Operations (INPO) and by international groups, such as IAEA, and the industry and regulatory bodies in other countries, such as Canada, Finland, Germany, Hungary, Spain, Switzerland, and the U.K. Most either use the INSAG-4 definition (e.g., the International Committee on Nuclear Technology in Germany, the transportation industry in the U.S.; the Hungarian regulator, or build on the elements of the INSAG-4 definition (e.g., in Finland.) While the INPO definition is slightly different, it is similar and encompasses the same concepts and elements as the INSAG-4 definition.

Since safety management is a newer term, the practical definitions of safety management are still evolving and there is not as much convergence across groups and nations on the essential elements that comprise safety management. Some regulatory bodies in other countries, e.g., Switzerland and Finland, have begun to use the term safety management. Those who use the term have either adopted the INSAG-13 definition, or built on the INSAG-13 definition.

Based on their review of the various uses of the terms safety culture and safety management, the staff determined that the term *safety management* is not as widely used nor as commonly understood as the term *safety culture* across different groups in the U.S. and internationally.

Most importantly, *safety culture* is the overriding concern and desired outcome of those groups who use the term *safety management*, i.e., promoting and ensuring a strong safety culture is the driving force behind oversight of safety management.

A Model of Safety Culture and Safety Management

Dr. Edgar H. Schein, Sloan Fellows Professor of Management Emeritus, Massachusetts Institute of Technology (MIT), developed a model of culture which IAEA and others adopted for their safety culture model. Figure 2 is representative of Dr. Schein's model which has three levels of organizational culture:

- Level 1: Artefacts (visible): Tangible products, behavior, organization structure and production processes

- Level 2: Espoused values (not visible, but can be elicited): Values and norms, strategies, objectives, philosophy

- Level 3: Basic assumptions: Unconscious and self-evident beliefs and assumptions

The concept of safety culture encompasses all three levels of Schein's model, including basic assumptions. Safety management elements primarily fall into Dr. Schein's Level 1 – the regulations and procedures (the *how* safety is achieved), Level 2 - policy statements, and the outcomes of safety management that can be observed in behaviors. Although an organization's basic assumptions are less amenable to direct regulatory oversight than visible artefacts and espoused values, problems at Level 3 can serve as the "root causes" that may lead to repetitive and far-reaching safety performance problems. The regulator can gain insights into the third level for plants exhibiting declining performance, through more intrusive oversight in supplemental reactive inspection programs. For example, through evaluating the licensee's safety culture assessment and through NRC's independent assessment of the licensee's safety culture in the conduct of IP 95003.

The NRC's Proposed Components of Safety Culture

The NRC's proposed components of safety culture contain a mix of Level 1: performance outcomes; Level 2: policies, programs and processes, i.e., "Corrective Action Program" and formal "Safety Policies" (management); and Level 3: attitudes (culture and outcomes). *Safety culture* encompasses all 13 safety culture components developed in the initiative for the enhanced ROP. *Safety management* encompasses only a subset of the safety culture components. For example, the safety-conscious working environment components are aspects of safety culture but not safety management.

CONCLUSION

Based on consideration of the factors described above, the staff believes that the term safety culture versus safety management should be used in the NRC's enhanced ROP for the following reasons:

(1) The term, "safety culture," is used internationally with general convergence on the elements of the definition, as first established in the INSAG-4 Report. The term, "safety management," is used in a subset of countries, but is applied differently and there is not yet convergence on the elements of safety management. Importantly, the countries and organizations that use the term

"safety management" are ultimately concerned about "safety culture" as the outcome of safety management.

(2) Safety culture encompasses the three levels of Dr. Schein's model of organizational culture (the basis for most safety culture definitions), whereas "safety management" encompasses only the top level (artefacts) and part of the middle level (espoused values). The lowest level, "basic assumptions," can be of greatest concern to the NRC and other regulatory and industry bodies, because often this level encompasses the root causes that may lead to repetitive and far-reaching safety problems. However, this level is not addressed by the most common definitions of "safety management" (cf. INSAG-13).

(3) Currently the term "safety culture" encompasses all of the NRC's components of safety culture, while only a subset of the components fit under the term "safety management." This is an important distinction since all the safety culture components would need to be evaluated in the supplemental inspection program.

(4) Some stakeholders have expressed concern about introducing new terms and concepts. Safety culture is a term in common use in the US nuclear power industry and has achieved a common understanding through INPO's Principles for a Strong Nuclear Safety Culture and other industry methodologies.

References

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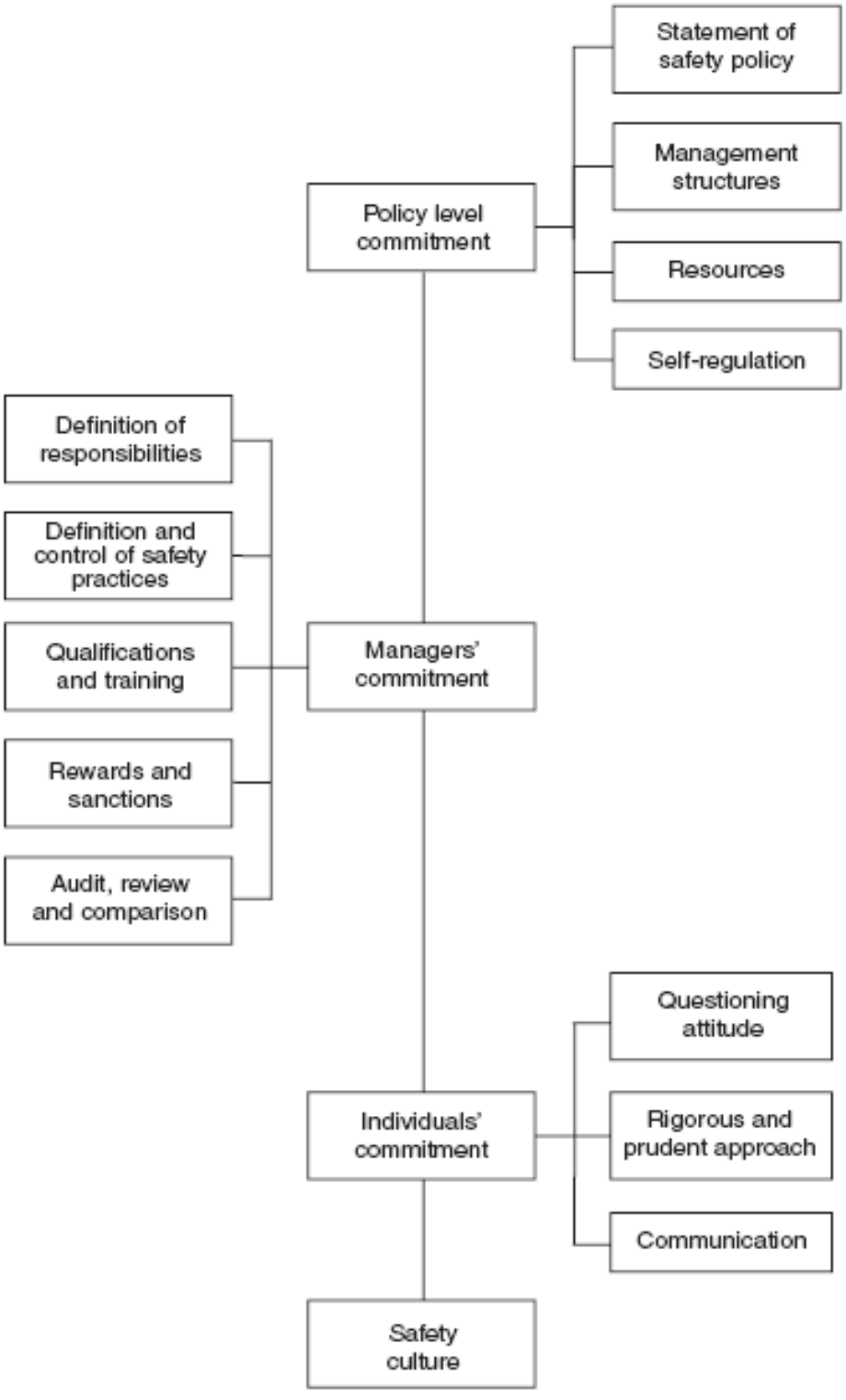
Statement of safety policy
Management structures
Policy level commitment
Resources
Self-regulation
Definition of responsibilities
Definition and control of safety practices
Qualifications and training
Managers' commitment
Rewards and sanctions
Audit, review and comparison
Questioning attitude
Individuals' commitment
Rigorous and prudent approach
Communication
Safety culture

Figure

1. Illustration of the Presentation of Safety Culture (INSAG-4, 1991)

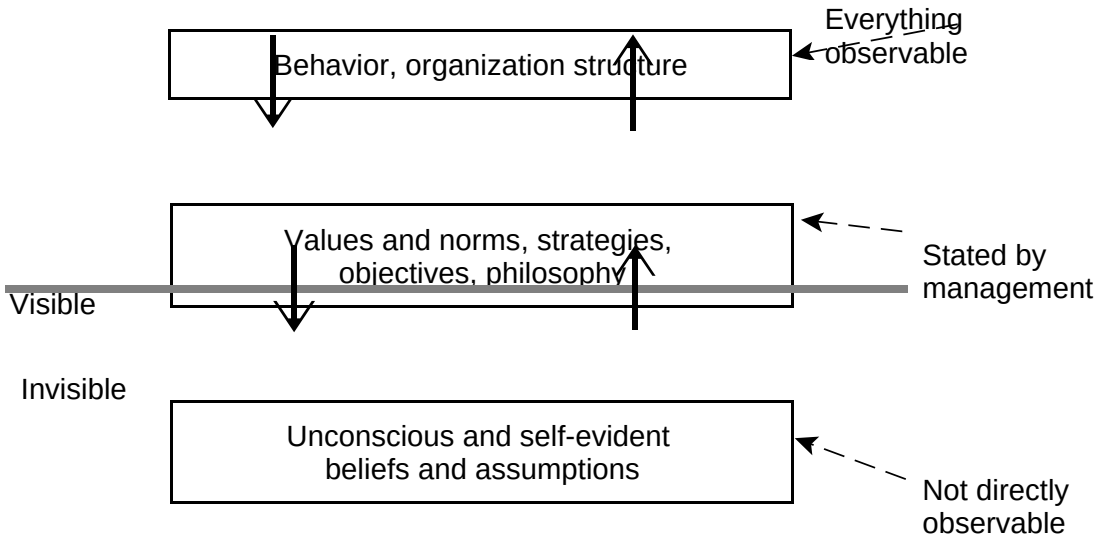

Figure 2. The levels of organization culture